Dissertation on

COMPARISON OF HISTOPATHOLOGY IN EMERGENCY AND DELAYED APPENDICECTOMY SPECIMENS

Submitted in partial fulfilment of the

requirement for the award of the degree of

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CERTIFICATE

This is to certify that this dissertation on **COMPARISON OF HISTOPATHOLOGY IN EMERGENCY AND DELAYED APPENDICECTOMY SPECIMENS** presented herein by **Dr.JESSIMA SUBAHANI.K.**, is the original work done in the Department of General Surgery, Government Stanley Medical College and Hospitals, Chennai in partial fulfilment of requirements of M.S. Branch-I (General Surgery) examination of The Tamilnadu DR.M.G.R.Medical University to be held in April 2013 under guidance and supervision, during the academic period of 2010-2013.

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DECLARATION

I, **DR.JESSIMA SUBAHANI.K,** solemnly declare that this dissertation, titled **"COMPARISON OF HISTOPATHOLOGY IN EMERGENCY AND DELAYED APPENDICECTOMY SPECIMENS"** is a bonafide record of work done by me in the Department of General Surgery, Government Stanley Medical College and Hospitals, Chennai under the guidance of my unit chief **PROF.DR. BALAMURUGAN M.S.,** Addl. Prof. of surgery.

This dissertation is submitted to The Tamilnadu DR.M.G.R. Medical University, Chennai in partial fulfilment of regulations for the award of M.S. (General Surgery) examination, to be held in APRIL 2013.

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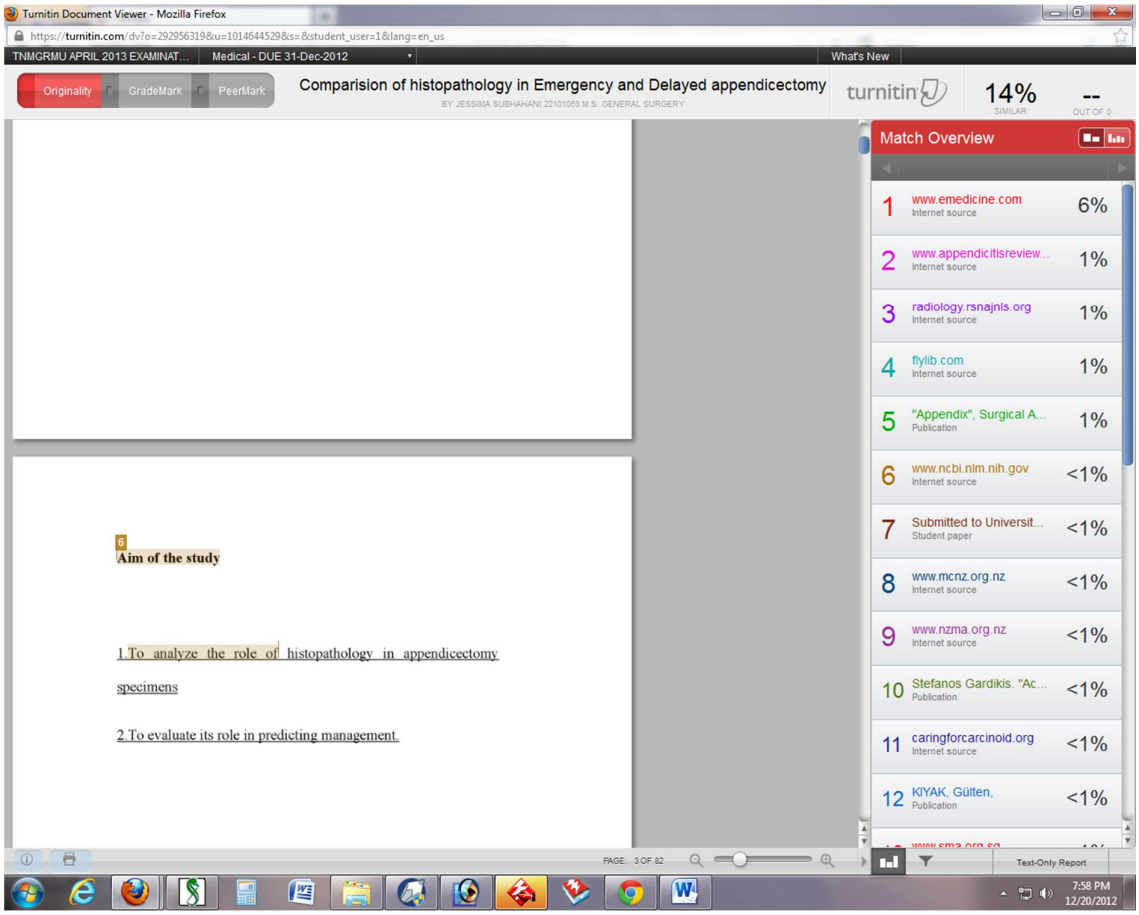
CONTENTS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Aim of the study
1.To analyze the role of histopathology in appendicectomy specimens
2.To evaluate its role in predicting management.
PAGE: 3 OF 82
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INTRODUCTION

Appendicectomy is the most common emergency abdominal surgery performed worldwide. The common age groups involved are the adolescents and the young adults .Operative management is the key procedure in acute appendicitis, with acceptable negative appendicectomies.

Presently the trend is towards a conservative management in an acute phase with or without definitive surgery at a later date. The present study evaluates the histopathology of the appendicectomy specimens retrieved during emergency and delayed appendicectomies and compares the progress of the disease event, evaluating the conservative management option in our setup.

AIM OF THE STUDY

1. To analyze the role of histopathology in appendicectomy specimens

2. To evaluate its role in predicting management.

REVIEW OF LITRATURE

Leonardo da Vinci	1492	Showed appendix in drawings ; called it "orecchio" (little ear); published in the 18th century
Berengario da Carpi	1521	First person to describe the appendix
Andreas Vesalius	1543	Showed the appendix in a drawing but did not describe it in the text
Jean Fernel	1544	Early description of appendicitis
Lorenz Heister	1711	description of perforated appendix with abscess formation
Giovanni Battista Morgagni	1719	First detailed anatomic description of appendix
Claudius Amyand	1736	Performed the first appendectomy.
Mestivier	1759	Described perforation of the appendix by a pin; considered perforation the cause of the abscess; the second unequivocal case identifying appendix as site of disease

John Hunter	1767	Described gangrenous appendix at autopsy
John Parkinson	1812	Described autopsy findings, with perforated appendix containing a fecalith in a 5 year old.
Louyer-Villemay	1824	Described fatal gangrenous appendix in two young men; first clinical history of acute suppurative appendicitis
Francois Melier	1827	Presented six autopsy descriptions of appendicitis and suggested that perhaps surgical removal of the appendix was in order
Goldbeck	1830	Described acute suppurative appendicitis but said cause was irritation of caecum; first use of term "perityphlitis"
Guillaume Dupuytren	1835	Ascribed RLQ abscesses to pericaecal origin without mention of appendix
Stokes	1838	Used large doses of opium to treat intra abdominal inflammations

Thomas Addison and	1839	Described symptoms of appendicitis; stated that appendix was the cause of many or
Richard Bright		most of the inflammatory processes of the right iliac fossa
A. Grisolle	1839	Advocated drainage of abdominal abscesses following watchful waiting until fluctuation
Volz	1846	Identified the appendix as the origin of RLQ inflammatory process
Henry Hancock	1848	Recommended earlier operation for drainage of abscesses
Willard Parker	1867	Recognized obstructive origin of appendicitis; reported four cases of abscess secondary to perforated appendix; advised surgical drainage after the 5th day of the disease, but did not advise operation before perforation
Lawson Tait	1880	Removed a gangrenous appendix; in 1890 abandoned appendectomy

Abraham Groves	1883	Removed an inflamed appendix; not published until 1934
Mikulicz	1884	Removed the appendix but patient did not survive
Krönlein	1884	Perhaps, rather than Amyand in 1736, was first to perform appendectomy
Charter-Symonds	1885	Extra peritoneal removal of fecalith
Reginald Heber Fitz	1886	Advocated early surgical removal of acute appendix; first used term "appendicitis"
R.J. Hall	1886	Successfully removed perforated appendix within an irreducible inguinal hernia with pelvic abscess
John Homans	1886	Operated on an 11-year-old boy, draining the abscess with good recovery

Thomas G. Morton	1887	Successful operative removal of perforated appendix with draining of abscess
Edward R. Cutler	1887	Performed one of the first "clean" unruptured appendectomies; reported in 1889
Henry Sands	1888	Removed two fecaliths and closed the perforation of the appendix
Charles McBurney	1889	Described abdominal point tenderness (McBurney's point)
	June, 1894	Presented "gridiron incision" (McBurney's incision) to Chicago Medical Society (CMS)
Lewis L. McArthur	July, 1894	Published his vertical midline incision technique, which was postponed from presentation at June meeting of CMS
G.R. Fowler	1894	Advocated "cuffing" of appendiceal stump
R.H.M. Dawbarn	1895	Advocated invagination of appendiceal stump to prevent postoperative fistula

William Henry Battle	1897	Advocated a vertical incision through the lateral edge of the right rectus sheath; others also advocated it, and incision sometimes is referred to as Battle-Jalaguier-Kammerer incision
A.C. Bernays	1898	Reported 71 consecutive appendectomies without mortality
Harrington, Weir, and Fowler	1899	Described medial extension of gridiron incision by dividing lateral portion of rectus sheath (Fowler-Weir extension)
A.J. Ochsner	1902	Advocated nonoperative treatment to localize spreading peritonitis
John B. Murphy	1904	Reported 2000 appendectomies without death
H.A. Kelly	1905	Advocated against "ligating, amputating, and burying the little stump"
A. E. Rockey,	1905	Each advocated transverse skin incision (later called Rockey-Davis incision)
Arthur Rendle Short	1925	Investigated appendicitis as "a disease of Western civilization," low-fiber diet

LeGrand Guerry	1926	Cited 2,959 personal cases of appendectomy
A.J.E. Cave	1936	Described appendiceal duplications and abnormalities
D.C. Collins	1951	Described agenesis of the appendix
Skandalakis et al.	1962	Collective review of cases of smooth muscle tumors of the colon and appendix as reported in the world literature
O'Neill	1966	Described use of appendix as fallopian tube
E. Higa et al.	1973	Described proliferative epithelial tumors of appendiceal mucosa
de Kok	1977	Laparoscope-aided appendectomy with mini-laparotomy
A.P. Dhillon, L. Papadaki, J. Rode	1982 to 1983	Studied subepithelial neuroendocrine cells; immunoreactivity for serotonin
Semm	1983	Laparoscopic appendectomy

EMBRYOLOGY

The caecal bud arises as a diverticulum from the post-arterial segment of the mid gut loop from which develop the caecum and the appendix due to a differential growth pattern.

The appendix is visible at about the eighth week of gestation. At first, it projects from the apex of the caecum. As the caecum grows, the origin of the appendix shifts medially toward the ileocaecal valve. The taenia coli also show a medial displacement towards the base of the appendix where they converge.

This shift does not occur in 5-15% of individuals. In these cases, the appendix is funnel-shaped. If the appendix is of normal shape, it is still located symmetrically on the caecal apex.

The appendix is circular in cross-section up to 12 weeks of gestation and later becomes lobed. Villi are found in the 4^{th} and 5^{th} months, disappearing before birth. In the wall of the appendix a few lymph nodules appear by the 7^{th} month. They increase up to puberty and later gradually decrease. Obliteration of the lumen is common in elderly patients.

Congenital Anomalies

Because of its seemingly vestigial nature, one would expect to find great variability of the appendix, but this is not the case. Appendiceal variations are few, and are all rare. In few patients, there might be absent appendix with or without caecum. In the presence of caecum, the most frequent cause is the lack of the differential growth, seen as more than four haustrations in the caecum. Also before committing on absent appendix, one must look for it in the retrocaecal and ileocaecal regions thoroughly. Also we should look for appendiceal autoamputation, intussusception or volvulus.

Ectopic appendix

Historically appendix has been found in the thorax, associated with malrotation and diaphragmatic defect, in lumbar region and within the posterior caecal wall.

Duplication of appendix

It may be the “double barrel type”, “bird-type” or “taenia coli”type.

There may be anomalies like diverticula and presence of heterotrophic mucosa.

Normally the caecum migrates to the right iliac fossa, the site of classical pain of appendicitis. If this is arrested during development it results in a subhepatic appendix.

Left sided appendix -occurs with

1)Situs invursus totalis-In situs inversus totalis the appendix is present in the left iliac fossa , causing difficulty in diagnosis on inflammation.

2) A wandering caecum with a long mesentery or a very long appendix crossing the midline

ANATOMY

The appendix is a narrow tube like structure arising from the posteromedial caecal wall, 2 cm below the ileocaecal junction. The average length is 9cm –can vary between 2-20 cm. The average diameter at the base is 0.6 cm. The base of the lumen is guarded by a semi lunar valve (Gerlach valves).

The position of the appendix is marked by the convergence of the three taenia coli over the caecum. The position of the appendix is not attributed to the percentage of its involvement in inflammation.

The base of the appendix is a fixed one where as the tip can be in any of the following positions:

Retrocaecal	--	Commonest ---	74%
Pelvic	--		21%
Paracaecal	--		2.5%
Subcaecal	--		1.5%
Pre-ileal	--		1%
Post ileal	--		0.5%

As appendix is a part of caecum, there is no true mesentery. The mesoappendix is a fold of peritoneum arising from the lower surface of the mesentery of the terminal ileum and it encloses the appendicular artery and veins. The mesentery frequently appears to be too short for the appendix, which may be sharply bent on itself.

The appendicular artery originates from the ileocolic artery, less often an ileal branch, or from a caecal artery. The vein and artery to the appendix lie in the edge of the mesentery.

Occasionally there may be an accessory appendicular artery known as “Accessory appendicular artery of Sheshachalam” traversing the mesoappendix, which is a frequent cause of bleeding after main vessel ligation in appendicectomy.

The appendicular vein ends in caecal veins to become the ileocolic vein, and drains in to the right colic vein. Lymphatic drainage is through a chain of nodes lying along the appendicular, ileocolic, and superior mesenteric arteries .From these lymph reaches the celiac lymph nodes and the cisterna chyli.

The celiac and superior mesenteric ganglia give the sympathetic nerve supply and the vagus nerve provides parasympathetic innervation

Pain sensation is through the eighth thoracic spinal nerve, or by the 10th and 11th thoracic nerves.

HISTOLOGY

The appendiceal wall is similar to the wall of the colon. It is formed by

1.The serosa

2. A muscular layer composed of the longitudinal and circular layers. At the appendiceal base, the longitudinal muscle produces a thickening that is related to all caecal taeniae.

3. The submucosa, which contains many lymphoid islands.

4. The mucosa.

The columnar epithelial cells and attenuated antigen-transporting membrane or M cells cover the mucosa. Even though the association between columnar epithelial cells and lymphocytes within the epithelial layer of the gut and other organs is well known, much work remains to establish the real role of interactions between lymphocytes and the enteric mucosa.

Function

Although in humans the appendix appears to be vestigial as a digestive organ, it emerges as a fully developed and functional lymphoid organ. The intramural lymphoid nodules do not have communicating channels with the serosal lymphatics and they play a role in the Gut Associated Lymphoid Tissue chain,

secreting IgA.These maintain the mucosal immunity from the invading bacteria. Also appendix is of late used as a sphincter in reconstructed bladder from ileum and as a replacement of short segment of ureter, with its blood supply.

Surgical Anatomy of Appendicectomy:

The incision for appendicectomy is made over McBurney's point., which is at right angles to a line between the anterior superior iliac spine and the umbilicus at two-thirds the distance from the umbilicus. One-third of the incision should be above the line; two-thirds should be below.

INCIDENCE

Acute appendicitis is relatively rare in infants. Its incidence increase in childhood and early adult life and peaks in the teens and early 20s . Later the risk declines.

Before puberty, the incidence of appendicitis is equal in both sexes.

In teenagers and young adults the male-female ratio increases to 3:2. The incidence of male preponderance declines in the elderly.

There is8.6%lifetime risk for males and 6.7% life time risk for females for appendicitis and 12.0% and 23.1% life time risk for appendicectomy in the male and female respectively.

ETIOPATHOGENESIS

Luminal obstruction is the prime etiological event in appendicitis. This may be due to hyperplasia of the submucosal follicles, which occurs in around 60% of patients, especially children and forms the ‘catarrhal appendicitis’.

Other important cause is a fecolith or fecal stasis, usually seen in adults making around 35 % of the patients. Remaining patients present due to rare cause like foreign body obstruction (4%), parasitic infestation and tumors (1%).

Obstruction is followed by an increase in mucus production in to the lumen causing increased intra luminal pressure. The stasis of mucus causes a bacterial overgrowth in the region converting the mucus into pus which further rises the intraluminal pressure, causing distension of the appendix, felt as the visceral pain, commonly in the epigastric and periumbilical regions due to common dermatomal supply by the nerves to these regions.

With increasing intra luminal pressure, there is obstruction of lymphatics causing appendicular edema, known as acute appendicitis. The irritation of the parietal peritoneum on the appendix localises the

pain to the right lower quadrant. This is perceived as a migrating abdominal pain in patients with appendicitis.

As the obstruction progresses, venous obstruction ensues leading to a swollen appendix and translocation of the gut bacteria occurs, commonly known as acute suppurative appendicitis. Gangrene and perforation occur at last with venous thrombosis and arterial compromise.

Following perforation if the exudates is walled off by the omentum it forms an appendicular mass, where in further suppuration may occur to progress to an appendicular abscess or resolve later without much symptoms. In young children and elderly people due to smaller omentum and atrophied omentum respectively, this localisation does not occur and hence they are prone for diffuse peritonitis.

Bacteriology of appendicitis –the common organisms *are*Escherichia *coli, Streptococcus viridans,* Bacteroides and *Pseudomonas* species.

CLINICAL PRESENTATION

SYMPTOMS

Pain abdomen is the most common symptom. The specific characteristics of the pain, its migratory nature and duration are all reliable indicators of acute appendicitis. The patients' pulmonary, gynaecological and recent genitourinary symptoms also give clue to exclude other disorders.

The migratory nature of pain is present in only 50% of individuals. Some will present with vague pain, pain in the suprapubic region and dysuria. Other than abdominal pain, nausea and anorexia are other two reliable symptoms with an onset within 24-36 hours.

Uncommon symptoms include increased frequency of micturition, due to bladder irritation, presence of diarrhoea in patients with a pelvic appendix.

SIGNS

Patients can have a low-grade fever (~38°C). Abdominal examination shows decreased bowel sounds, tenderness and local guarding. The exact location of the tenderness is commonly at

McBurney's point. The normal appendix is mobile hence the site of maximal pain and tenderness can vary.

Peritoneal irritation can be demonstrated by the voluntary and involuntary guarding on percussion, or rebound tenderness (Blumberg's sign)

Rovsing Sign- presence of tenderness in the right iliac fossa when giving a gentle thrust in the left iliac fossa.

Pointing sign-on asking the patient to point the site of maximum tenderness, the patient points to the right iliac fossa.

Dunphy' s sign- pain in the right iliac fossa on coughing.

Aaron's sign-pain referred to the epigastric region in appendicitis

Cope's Psoas test-Patient feels pain on extension of right hip-seen in retrocaecal appendicitis.

Obturator sign-seen as pain on internal rotation of hip, as with pelvic appendicitis

Diffuse peritonitis is indicative of free abdominal perforation. An abscess may be suggested by the presence of a tender mass in the right

lower quadrant. Rectal and pelvic examinations are most likely to be negative. However, if the appendix is located within the pelvis, tenderness on abdominal examination may be minimal, whereas anterior tenderness may be elicited during rectal examination as the pelvic peritoneum is manipulated. Pelvic examination with cervical motion may also produce tenderness in this setting.

If the appendix perforates, abdominal pain becomes intense and more diffuse, and abdominal muscular spasm increases, producing rigidity. The heart rate rises, with an elevation of temperature above 39°C. The patient may appear ill and require a brief period of fluid resuscitation and antibiotics before the induction of anaesthesia. Occasionally, pain may improve somewhat after rupture of the appendix, although a true pain-free interval is uncommon.

Risk factors for perforation of the appendix:

- infancy and elderly people.
- Immunocompromised
- Diabetics
- Obstruction by appendicolith

■ Pelvic appendix

■ Previous abdominal surgery

The varied positions of the appendix cause variable clinical picture:

– *Retrocaecal appendix:* Right lower quadrant / right flank pain with ureteric irritation

– *Pelvic appendix:* urinary symptoms and pelvic pain; pelvic inflammatory disease must be ruled out.

– *Subhepatic appendix:* Due to caecal malrotation; presents gallbladder symptoms

– *Upper or lower midline appendix:* Epigastric or hypogastric pain

- *Situs inversus:* When present, pain is located at the LLQ.

LABAROTORY DIAGNOSIS

The WBC is slightly elevated in nonperforated appendicitis, and markedly elevated in the presence of perforation. The WBC can be normal in patients with acute appendicitis, particularly in early cases. A rising value on serial studies of WBC helps for an accurate diagnosis. Also the differential count shows neutrophilia.

Patients with non specific abdominal pain should undergo a routine urine analysis to rule out urinary tract infection and ureteral calculus which is marked by significant hematuria with colicky abdominal pain and testing directed at this diagnosis is indicated.

Presence of a urinary tract infection, does not exclude the diagnosis of acute appendicitis but it should be identified and treated. In a patient with appendicitis a few white blood cells may be present in urine due to inflammation of the ureter by the adjacent appendix.

Other laboratory tests that may be useful are serum liver enzymes and amylase to help in diagnosing liver, gallbladder, or pancreatic disease, in patients complaining of mid-abdominal or right upper quadrant pain.

All women of childbearing age group should have a beta-HCG done to rule out ectopic or concurrent pregnancy as ectopic pregnancy requires prompt diagnosis and treatment and ionising radiation exposure for diagnostic purposes can be avoided with concurrent pregnancy.

C - reactive protein

Levels of C-reactive proteins in appendicitis can been measured and correlated with the severity of the disease process. As it's an acute phase protein, it holds value in early identification of perforation.

Bilirubin levels, D-dimer studies and pro calcitonin levels though suggested are only supplementary to CRP levels in denoting the severity.

CLINICAL SCORING

Using Bayesian analysis, these historic, physical, and laboratory data have been incorporated into a variety of clinical scoring systems, several of which have been evaluated prospectively. The Alvarado or MANTRELS score is perhaps the most commonly used, and is actually a quantification of the most common signs, symptoms and laboratory findings typically associated with acute appendicitis.

ALVARADO SCORING:

VARIANT	SCORE
MIGRATORY PAIN	1
ANOREXIA	1
NAUSEA	1
TENDERNESS IN RIF	2
REBOUND TENDERNESS	1
ELEVATED TEMPERATURE	1
LEUCOCYTOSIS	2
SHIFT TO LEFT(NEUTROPHILIA)	1

ALVARADO-INTERPRETATION

Total of 5 to 6 → possible appendicitis

Total of 7 to 8 → probable appendicitis

Total of 9 to 10 → very probable appendicitis.

In setups where differential count cannot be done a Modified Score is calculated for a total of nine points.

The scoring system is adjunct to clinical examination and is no replacement for clinical suspicion, as stated by a study by Saidi and Chavda. They are more useful in interpreting situations where the diagnosis appears confused.

Special Situations

INFANTS:

-Relatively rare in infants below 3 years of age.

- Diagnosis is often delayed & incidence of perforation and postoperative morbidity is high.

CHILDREN

- Usually associated with vomiting and have anorexia and insomnia during an acute attack, with absent bowel sounds in early stages.

ELDERLY

- At very high risk for gangrene and perforation

- As the abdominal wall is lax or obese the signs and symptoms are masked or very minimal.

- Coexisting medical condition, late presentation cause more morbidity & mortality.

Pregnancy

It is the most common extrauterine acute abdominal condition during pregnancy, occurring in 1:1500–2000 pregnancies.

There is a diagnostic delay as the early symptoms mimic the non specific symptoms of pregnancy.

Obstetric teaching has been that as pregnancy progresses the caecum and appendix are gradually pushed to the right upper quadrant of the abdomen.

However, pain in the right lower quadrant of the abdomen remains the cardinal feature of appendicitis in pregnancy. Abortion rate is 3–5% of cases, increasing to 20% if perforation is found at operation.

Immunocompromise

Appendicitis can also affect patients who have undergone organ transplantation, on chemotherapy, have blood borne malignancy, or are HIV infected.

Hepatitis, pancreatitis, acalculous cholecystitis, intra-abdominal opportunistic infections, secondary malignancies (like Kaposi's sarcoma), graft-versus-host disease, and typhlitis should also be considered here. Hence there can be a diagnostic delay and late presentation to surgical evaluation, ending with perforation.

As abdominal pain is a common symptom in patients with HIV/AIDS, its difficult to differentiate surgical from non surgical condition Fever and leucocyte count also do not help in these subset of patients and hence some advocate CT scan.

Once diagnosed with appendicitis, these patients should also undergo appendicectomy as their immunocompromised state is not a contraindication for the procedure.

DIFFERENTIAL DIAGNOSIS:

Gastrointestinal	**Gynaecologic**	**Systemic**
Meckel's diverticulitis	Ectopic pregnancy	
Intestinal obstruction	Ovarian torsion	Porphyria
Diverticulitis	Endometriosis	
Duodenal ulcer	Pelvic inflammatory	Diabetic ketoacidosis
Gastroenteritis	disease	Sickle cell disease
Intestinal obstruction	Ruptured ovarian cyst	Henoch-Schönlein
Intussusception	(follicular, corpus	purpura
Mesenteric	luteum)	Pneumonia (basilar)
lymphadenitis	Tubo-ovarian abscess	
Neoplasm (carcinoid, carcinoma, lymphoma)		

Genitourinary	Other
nephrolithiasis	Parasitic infection
Pyelonephritis	Psoas abscess
Torsion testis	Rectus sheath hematoma
UTI	
Wilms' tumor	
Prostatitis	

With atypical clinical presentations, radiographic studies take on increased importance in the diagnosis of acute appendicitis.

Role of plain radiograph

The plain x ray findings that can be found are

1. Fluid level in terminal ileum or caecum
2. Gas and ileus of caecum and ascending colon
3. Blurred right psoas shadow
4. Blurred of right flank stripe

5. Right lower quadrant showing increased soft tissue density

6. Deformed caecal gas shadow

7. Presence of fecolith

8. Intraperitoneal gas

Barium enema is used by certain centres and the findings in it are:

- Persistently appendix being not visualised
- Partially visualised appendix
- Caecum showing pressure defect
- Irritable caecum or terminal ileum on screening

These procedures are now outdated by ultrasound.

In general, these tests are useful only if they clearly demonstrate appendicitis. Negative or equivocal studies do not rule out appendicitis.

Ultrasonography

The criteria for diagnosing appendicitis are:

1. The inflamed appendix is seen as a tubular structure from the base of the caecum which is blind-ended and has a laminated wall.

2. It is aperistaltic and noncompressible.

3. A diameter of 6 mm is essential for diagnosing acute appendicitis.

4. Active inflammation is marked by circumferential colour in colour Doppler.

5. For retrocecal appendices, probe is placed in an oblique plane, adjacent to the caecum.

6. Pelvic appendix is best seen by trans vaginal ultrasound in women.

7. Fecoliths are seen as bright, echogenic foci with clean distal acoustic shadowing.

8. There may be decreased or no perfusion shown by color Doppler US in gangrene.

9. Once perforation occurs, the distended appendix is no longer visualised.

Though the criteria for the diagnosis of appendicitis focus on the appendix only, the “acrogenic mass effect” of the inflamed perienteric fat is often the first sign in sonography.

Classification of Acute Appendicitis According to Ultrasonographic Findings

	Pathological diagnosis	Layer of the wall of appendix	Submucosal layer
TypeI	Catarrhal	Clear	absent hypertrophy
TypeII	phlegmonous	indistinct	Hypertrophied
Type III	Gangrenous	Disrupted	Indistinct and partly lost

CT CRITERIA FOR THE DIAGNOSIS OF ACUTE APPENDICITIS:

The type and quality of the CT scan done influence the visualisation of the appendix. Thin slice Helical CT and dynamic cine view are of help.

The important influencing factors are:

i. Size of the appendix

ii. Amount of periappendiceal fat

iii. Amount of ileocaecal bowel opacification.

About 67-100% of symptomatic adult patients can be identified, response being higher with rectal contrast.

The following are the features of a normal appendix:

a. Appears like a ring like or tubular pericaecal structure which is collapsed or partially filled with air, contrast material or fluid.

b. Wall thickness of 1-2 mm

c. Mesoappendix may be identified

On inflammation, the appearance varies with the severity and the stage of the disease.

In patients with non-perforating appendicitis the organ is minimally distended, fluid filled with 5-6 mm diameter and has a homogenous fat attenuation of the mesoappendix.Such a condition is seen only in 5 % of the patients. Majority of them have higher degrees of luminal distension and transmural inflammation of size 7-15 mm diameter, which are further enhanced by intravenous contrast. Also mural stratification is seen as “target sign”.

Radionuclide Imaging:

- Radio labelled autologous leukocytes have been developed that have a high sensitivity and specificity in the diagnosis of appendicitis. - 99m Tc-labelled intact polyvalent human immune globulin and 99m Tc labelled anti-granulocyte antibody Fab fragments also have high sensitivity and specificity.

TREATMENT

Indications for surgery:

Any patient with suspected appendicitis who has

(1) Continuous pain and fever showing an increasing trend

(2) A rising leucocyte count or

(3) Worsening clinical examination findings should undergo appendicectomy or at least a diagnostic laparoscopy. Serial physical examination holds an important role in patients presenting with atypical symptoms. Alvarado scoring can guide for decision. Imaging studies like ultrasound and CT help in such situations.

TREATMENT

Role of Conservative management in Appendicitis

Coldrey in 1959 reported that appendicitis could be treated with antibiotics alone and following him many authors had their trials on the same.Cochrane database metaanalysis in 2011 has shown that Appendicectomy is still the gold standard in appendicitis and that antibiotics are useful in preop,post-operative situations and in certain special conditions alone where surgery is contraindicated.

Surgical management

The treatment of acute appendicitis is appendicectomy.

Appendicectomy can be done as either an Emergency Procedure or as an Interval procedure. Studies by Ingraham et al showed that a delay in appendectomy under monitored situations do not alter the overall length of hospital stay, operative time or rate of complications.

In conditions where a preoperative diagnosis of an appendicular mass is made, conservative management followed by Interval Appendicectomy is the procedure of choice.Gahukamble and Gahukamble in their study in children have shown that interval

appendicectomy benefits patients with thickened, fibrotic, lumen obliterated and chronically inflamed appendix after resolution of appendicular mass.

Preoperative preparation

All patients especially those with a presumed diagnosis of peritonitis should be adequately prepared before being taken to the operating room. Intravenous fluid replacement and resuscitation as rapidly as possible as should be made especially when peritonitis is suspected. Nasogastric suction if peritonitis and profound ileus are present and temperature > 39 degree celsius.

Broad spectrum antibiotic to cover gram-negative, anaerobic organism preoperatively to control and reduce incidence of wound sepsis. Antibiotics should be continued in case of gangrenous and ruptured appendix, while single dose is sufficient for early appendicitis.

Examination under Anaesthesia

All patients abdomen should be examined after induction of appropriate anaesthesia, such examination may reveal other diagnosis and appendicular mass.

Uncomplicated appendicitis without palpable mass

In these circumstances appendicectomy should be performed. Earlier the diagnosis made sooner the appendicectomy is performed, better the prognosis.

The recommended incisions are

- Grid-iron incision

- Transverse skin crease Lanz incision

- Rutherford Morison's if appendix is Para / retrocecal and fixed

Methods to be adopted in special circumstances:

- If the base of the appendix is inflamed, instead of crushing it is transfixed close to caecal wall gently after which appendix is amputated and stump invigilated. Invagination of the stump avoids the theoretical risk of bacterial spillage in to peritoneum and also adhesion.

- When the base is gangrenous, two sutures are placed through the wall of the caecum close to the base of gangrenous appendix, the appendix is removed flush with the ceacal wall and sutures are tied.

- Retrograde appendicectomy- with a retrocaecal appendix and adhesion, the base is divided first and then proceeded distally. This sometimes requires mobilisation of the caecum from its lateral peritoneal attachments.

- Drainage of peritoneal cavity: Usually unnecessary, may be needed when large amount of pus is present in the retrocaecal space or pelvis.

Laparoscopic appendicectomy

Most valuable aspect of laparoscopy is as diagnostic tool and if required to be used as therapeutic tool.

As females have a higher negative appendicectomy rate and elderly people a higher perforation rate a diagnostic laparoscopy is suggested in these age group as suggested by Marudhanayagam et al.

Pneumoperitoneum is established with an open method with an empty bladder in moderate Trendelenburg tilt of operating table. The appendix is found and appendicectomy done as in conventional method. Patients who undergo laparoscopic appendicectomy have less postoperative pain, early discharge from hospital and less wound infection. The incidence of postoperative intrabdominal sepsis may be

higher in patients operated on for gangrenous or perforated appendicitis when compared to open method.

Problems encountered during appendicectomy

If the appendix appears normal, other possible diagnosis according to age and sex should be excluded – terminal ileitis, Meckel's diverticulitis, tubal or ovarian causes. The appendix is usually removed to avoid future diagnosis difficulties.

When the appendix is not found-Caecum is mobilised and should trace along the taeniae coli up to their confluence.

An appendicular tumor is found- an appendicectomy is sufficient for tumors smaller than 2 cms, where as a right hemicolectomy is mandatory for larger ones.

An appendiceal abscess is present and not able to remove the appendix- local peritoneal toileting is done, any abscess present is drained and intravenous antibiotics are given.

In rare situations a caecectomy or a partial right hemicolectomy may be required.

Appendicitis complicating Crohn's disease

Appendicectomy can be done if the caecal part at the base of the appendix is healthy.

- Appendix is rarely involved in crohn's disease –if involved, a conservative approach may be warranted.

Appendix abscess

- CT or USG guided percutaneous drain, if it fails, a midline laparotomy is needed.

Pelvic abscess

A complication that occurs irrespective of position of the appendix- it causes spiking pyrexia, pelvic pressure, discomfort, and tenesmus.

- Rectal examination reveals a boggy mass in pelvis.

-Pelvic USG or CT confirms the diagnosis

- Transrectal drainage under general anaesthesia is required.

Management of an appendix mass

For an appendiceal mass with satisfactory patient condition, conservative OCHSNER- SHERREN regimen is adapted by careful record of the patient's general condition, extent of mass, its periodic examination, intravenous fluids and antibiotics.

Clinical detoriation or evidence of peritonitis is indication for early laparotomy. If an abscess is present, it should be drained under radiological control or open method.

Postoperative complications

Comparatively uncommon and relies on the amount of peritonitis present at the time of operation and other coexisting morbidities that may predispose to complications.

- Wound infection: Commonest complication -occur in 5 to 10% of all patients.

- Intrabdominal abscess: Relatively rare after use of preoperative antibiotics. Fever, malaise, poor appetite after 5-7 days of surgery suggest an intraperitoneal collection, the common sites are those in the interloop region, the subphrenic, pelvic and the paracolic sites.

Studies show that these types are commoner with laparoscopic appendicectomy in the presence of a gangrenous appendix with peritonitis.

- Abdominal USG/CT- confirm diagnosis

- Treated by Percutaneus drainage or laparotomy.

- Ileus -Persistent ileus may be indicative of intra abdominal abscess.
- Respiratory: Rare, adequate postoperative analgesics and early ambulation decrease the incidence.
- Venous thrombosis and embolism
- Portal pyaemia: - seen with gangrenous appendicitis associated with pyrexia, chills and jaundice. - It is caused by septicaemia in portal venous system and leads to formation of liver abscess.
- Fecal fistula - Occurs rarely. Seen in appendicectomy in crohn’s disease.
- Adhesive intestinal obstruction
- Right inguinal hernia: Due to iliohypogastric nerve injury.

Chronic and recurrent appendicitis:

- One or more attacks of acute appendicitis.

- Between the attacks patients are free of symptoms and physical examination is normal

- If fecolith is present an X ray, no filling of the appendix on Barium enema.

- On repeated examination during an attack shows evidence of recurrent appendicitis. Elective appendicectomy should be undertaken

Pathological examination of appendix:

A. Early acute appendicitis:

Macroscopy - Subserosal vessel congestion,

- Normal glistening serosa into dull granular red membrane

Cut section- may appear normal,fecolith may be present

Microscopy - Moderate peri vascular Neutrophilic infiltrate.

B. Acute suppurative appendicitis.

Macroscopy - Prominent polymorphic exudates form a fibrinopurlent reaction over the serosa.

Cut section - mucosal edema

Microscopy - Abscess formation within the wall of appendix

-Necrosis ulceration in the mucosa.

C. Acute gangrenous appendicitis :

Macroscopy_-gangrenous appearance

Microscopy - Large areas of hemorrhagic ulceration of mucosa and gangrenous necrosis through the wall extending to serosa.

D. Chronic appendicitis:

Macroscopy - Fibrosis in appendiceal wall. Partial to complete obstruction of the lumen.

Microscopy - Evidence of old mucosal ulceration, scarring and infiltration of wall with chronic inflammatory cells.

Intraepithelial infiltration of lymphocytes is associated with a diagnosis of parasitic infestation shown by Deniz et al and suggests management accordingly.

Though initially thought as a presentation of acute appendicitis spectrum, chronic appendicitis is presently considered as a separate entity as shown by the study done by Mussack T et al.

“Periappendicitis”, where there is serosal inflammation without mucosal /submucosal inflammation Features other than appendicitis, usually granulomata, enterobiasis, tumors etc

The routine histopathological examination of all surgically retrieved appendix specimens is warranted irrespective of the macroscopic appearance.

In their study, M E Herd et al have suggested that standard terminologies be used to report the specimen of appendicitis.

Operative Techniques

Appendicectomy can be done by two methods:

OPEN SURGICAL METHOD

LAPAROSCOPIC APPENDICETOMY

Open surgical method is still the commoner method used and can be done through various incisions.

GRIDIRON INCISION

This is the most commonly used and remains the incision of choice in a patient where the diagnosis of appendicitis is certain.

The incision is made at right angles to the spinoumbilical line centered over the Mc Burney's point. The incision is progressively deepened and one encounters the branches of the superficial circumflex iliac artery which needs to be ligated. The external oblique is seen and is incised in the line of the incision. Following this the internal oblique and the transverses abdominis muscle are seen which are separated and retracted. Thereafter, the peritoneum is incised to enter the abdominal cavity.

Grid-iron is a popular incision associated with the lowest incidence of complications.

LANZ INCISION

This is similar to the grid-iron incision except that it is transverse rather than oblique. Lanz incision is made 2cm below the umbilicus, centered on the midclavicular – midingunial line. It gives a better cosmetic result and is being increasingly used. The incision can be extended medially and when necessary the rectus abdominus muscle can be divided in the line of the incision.

RUTHERFORD MORISON'S INCISION

This is an oblique muscle cutting incision with its lower end centered over the Mc Burney's point. One resorts to this incision when there is an inadequate access with a Grid-iron incision.

PARAMEDIAN INCISION

-is preferred when the diagnosis is in doubt. It is a vertical incision given 1.25 to 2.5 cm to the right of the midline which commences 2.5 cm below the umbilicus and extends till just above the pubis. It provides good access to the pelvic organs in females and can easily be extended upwards. The disadvantages of this incision is the

poorer access to the right iliac fossa and real possibility of causing peritoneal contamination in an otherwise localized infection

Technique

When the abdomen is opened, any free fluid should be taken for culture and sensitivity. The rest of the pus and free fluid is sucked away.

The caecum is identified and held in a moist pack, gradually withdrawn towards its lower end medially. This normally delivers appendix into the wound.

In case of difficulty in identifying appendix then one should trace the taeniacoli on the caecum which leads to appendix. In case of difficulty there should be no hesitation in extending the incision or conversion to a muscle cutting incision.

Once the appendix is clearly visualized it is raise up and held by a Babcock's tissue holding forceps. The mesoappendix is then clamped, divided and ligated.

Thereafter the appendix is crushed by a forceps applied to the base which is moved distally to be reapplied and left in place. An atraumatic catgut purse string or a Z suture is inserted into the caecal

wall near the base of the appendix after prior ligation around the crushed portion.

Abdominal mops are placed all round the appendix which is divided by a knife distal to the forceps. The appendiceal stump is then invaginated into the caecum while the purse-string suture is tied. However, this may be impossible if the adjacent caecal wall is edematous and friable. Some surgeons omit the step of invagination.

Haemostasis is secured and peritoneal lavage with saline should be done, especially so in presence of pus.

Drainage is usually not necessary though in gross contamination soft drain may be kept for 48 hours. The wound is closed in layers. Some recommend if there is a gross contamination, skin wound should be left open and closed after few days under local anaesthetic.

Closure of the incision:

The peritoneum is identified, and hemostats are placed on the cut ends at both apices and the midpoint of the superior and inferior sides. The peritoneum is closed with a continuous 3-0 PG suture. The inferior oblique muscles are reapproximated with a figure-of-eight 3-0 PG suture, and the external oblique fascia is closed with a continuous

2-0 PG suture. The skin may be closed with staples or subcutaneous sutures.

LAPAROSCOPIC APPENDICECTOMY

- Is another possible method of performing this operation.
- Patients have a shorter period of stay in the hospital.
- It involves learning curve, greater operating time and higher cost.

A urinary bladder catheter is placed, and the surgeon typically stands on the left side of the patient. Video monitors are placed at the patient's feet.

An infraumbilical incision is made, followed by placement of the Veress needle. After confirmation of intraperitoneal placement, a pneumoperitoneum (14 mm Hg) is established and maintained using a carbon dioxide insufflator. The Veress needle is replaced with a 10-mm trocar, and a 10-mm, 30-degree laparoscope is used.

Alternatively, the 10-mm trocar can be placed directly into the abdominal cavity using an open cutdown approach.

Under direct visualization, a 5-mm trocar is inserted into the left lower quadrant (LLQ) and another 5-mm trocar in the right periumbilical region.

Through the right periumbilical trocar, a grasper is used to gain control of the appendix. A small hole in the mesoappendix is made using a dissector placed through the LLQ port at the base of the appendix.

An endo-gastrointestinal assistant stapler is then used to staple the base of the appendix, and a vascular reload is used to staple across the mesoappendix. Once the appendix is free, it is removed through the LLQ port. Appropriate peritoneal irrigation is then performed. The fascia of the LLQ and nfraumbilical port sites are closed with 0-PG suture, and the skin incisions are closed with subcuticular sutures.

Postoperative management:

If acute appendicitis is encountered, perioperative antibiotics covering skin flora should be continued for 24 hours. If suppurative appendicitis is encountered, intravenous antibiotics covering enteric flora should be continued for 48-72 hours and can be safely discontinued once the patient remains afebrile for 24 hours. In both

instances, clear liquids can be started once the patient is stable from anaesthesia, and diet can be advanced as tolerated.

If gangrenous or perforated appendicitis is encountered, continue intravenous antibiotics until the patient is afebrile and has return of bowel function and a normal WBC count with a normal differential.

Once bowel function returns, clear liquids can be started and the diet advanced as tolerated. In most patients, a nasogastric tube is not needed .

Follow-up care

The patient should return to the clinic 1-2 weeks following discharge for wound evaluation and discussion of the pathology.

Full activity may resume in 2 weeks following appendectomy if performed through an RLQ incision. If a midline incision was used, activity should be limited for 6 weeks.

MATERIALS AND METHODS

A Prospective study was conducted from November 2011to November 2012. All patients belonged to a single surgical unit.

A total number of 118 patients were included in the study. Inclusion criteria: Patients with appendicitis diagnosed clinically and by ultrasound.

- Exclusion criteria: a) Patients with appendicular mass or abscess at admission.

b) Patients less than 12 years and more than 60 years due to poor localizing signs.

- A proforma was made that included detailed history, physical examination, basic investigations and other relevant investigations required.

- Clinical scoring of the patients was done by Alvarado's scoring system.

- All patients diagnosed with clinical symptoms of acute appendicitis and ultrasound proven were taken for the study.

- Patients included in the study were haemodynamically stable without any concurrent illness.

- An informed consent for participating in the study was obtained.

- Patients operated within 12 hours were included in the Emergency appendicectomy group and those operated after initial fluid and antibiotic therapy after48-72 hours were included in the Delayed appendicectomy group.

Management

- All patients were operated under regional or general Anaesthesia

- All patients were given preoperative and Post operative antibiotics.

- Appendicectomy done by either open conventional method, through Lanz tranverse skin crease incision, right paramedian incision depending on the preoperative findings or by laparoscopy.

- During surgery the macroscopic pathological anatomy of the appendix noted. If the appendix was found to be normal, the other

etiologies were identified and treated in appropriate manner. In this situation, even though the appendix was normal, appendicectomy done to avoid future confusion in diagnosis.

- All the appendicectomy specimen were sent for histopathologic examination in the Department of Pathology ,GSH,Chennai, for clinicopathological correlation.

- Subsequently histopathological reports were obtained and analysed using standard statistical methods and conclusions drawn.

- After surgery the patients were discharged on 3-7days except in cases of complications.

OBSERVATIONS AND RESULTS

Age incidence

-The patients were from 12 to 58 years of age

-mean age was 24 years.

Our study excluded children less than 12 years and adults more than 60 years.

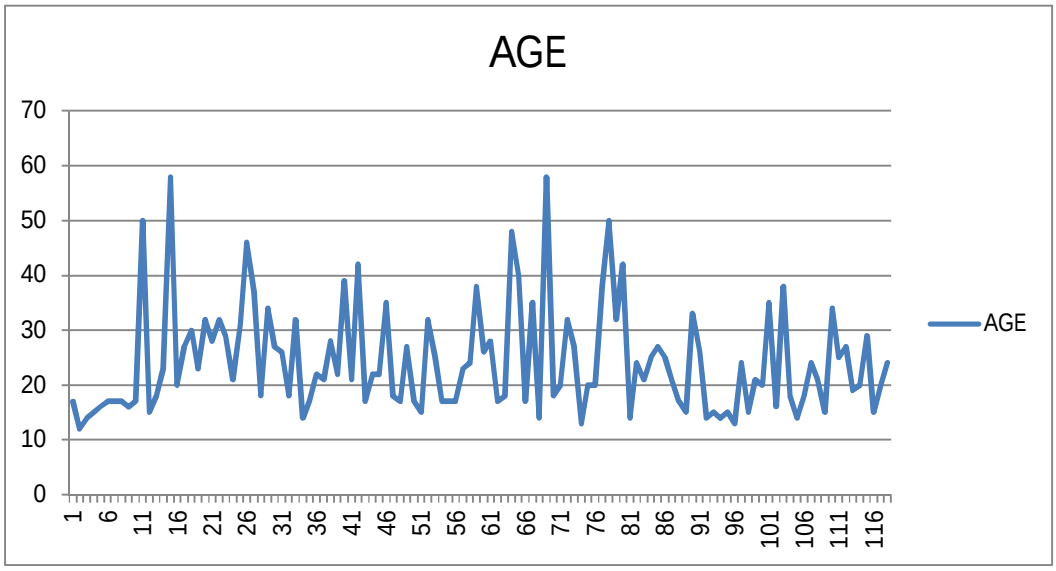


FIG.1 (a)

The age group wise distribution was as below:

AGE GROUP	NO.OF PATIENTS
12-<15	17
15- <30	73
30 -<45	22
45 -<60	6
TOTAL	118

Table.1

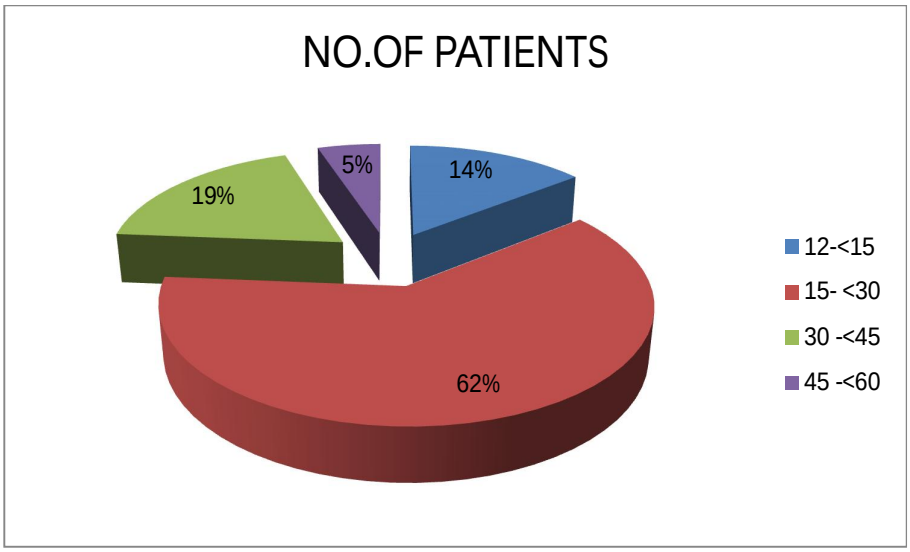


Fig 1(b)

Sex incidence

In emergency appendicectomy group a total number of 73 patients were studied. Of them 36 were male and 37 were females (1:1 ratio).

In the delayed appendicectomy group a total number of 45 patients were studied. Of them 21 male and 24 were females (1:1.1 ratio)

Fig2a

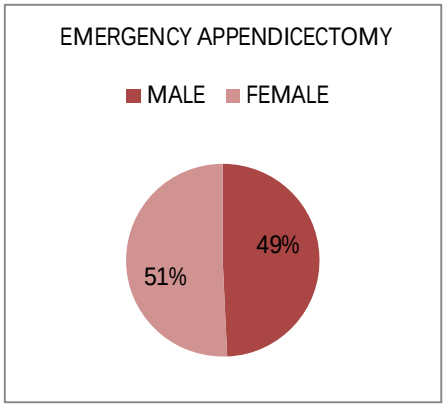
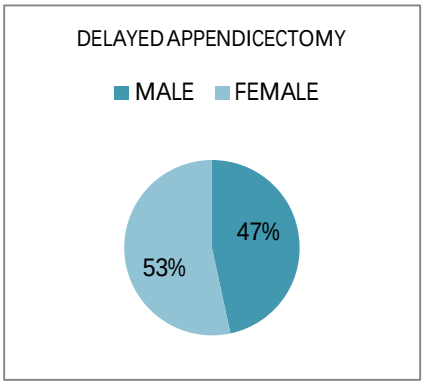


Fig 2b



CLINICAL SCORING

- The Alvarado scoring system was used
- The range of values were between 6-9
- The median was 7

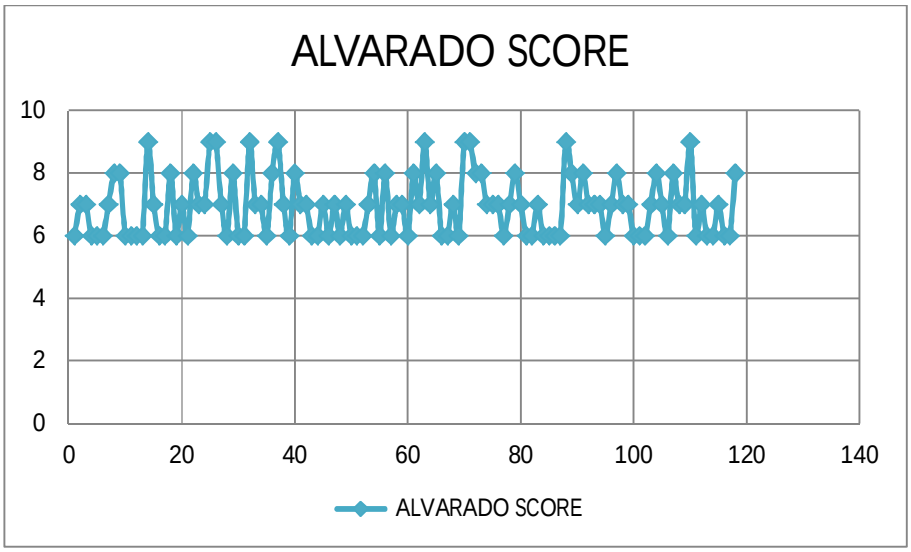


Fig.3

PATTERN OF DISTRIBUTION

The pattern of distribution of histopathological diagnoses in Emergency appendicectomy group was as follows:

Male patients

Acute appendicitis-23

Subacute appendicitis-6

Chronic appendicitis-3

Others-3(Appendicular perforation-1, Acute suppurative appendicitis-1, Associated Meckel's diverticulitis-1,)

Normal- 1

The age wise distribution of the various histopathological diagnoses is as below:

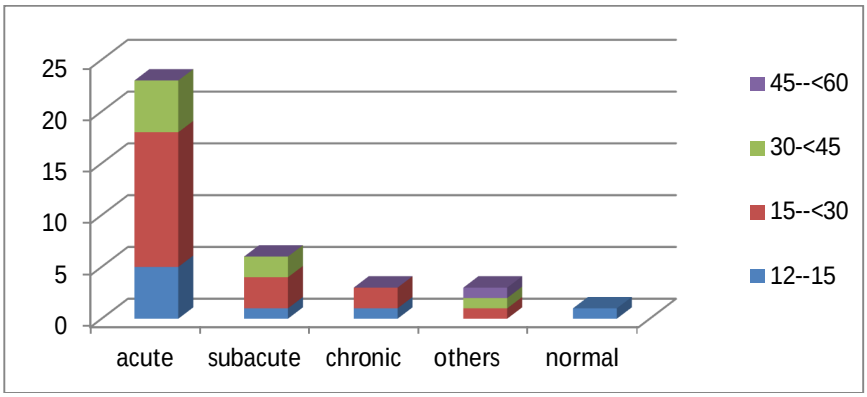


Fig.4

Female patients

Acute appendicitis-16

Subacute appendicitis-8

Chronic appendicitis-9

Other -1(Appendicular perforation)

Normal -3

The age wise distribution of the above is as depicted:

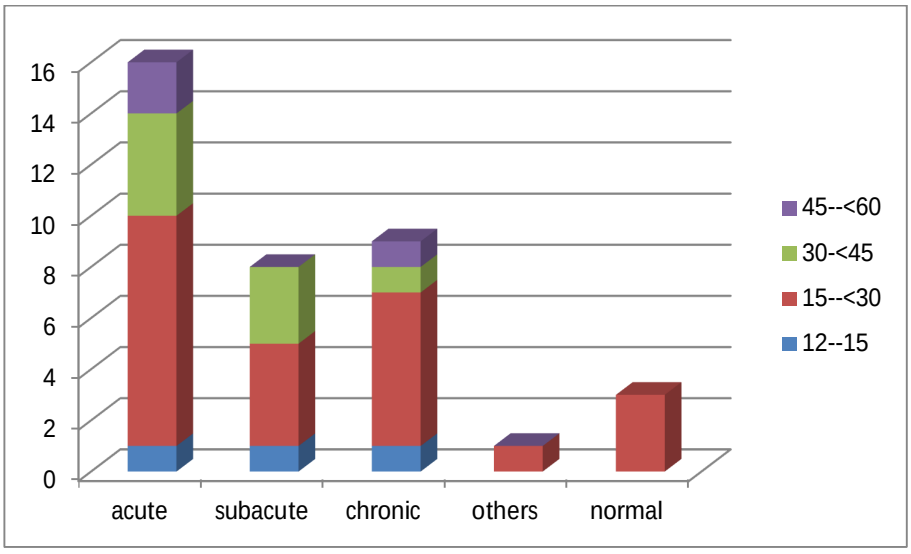


Fig.5

The pattern of distribution of histopathological diagnoses in Delayed appendicectomy group was as follows:

Male patients

Acute appendicitis-8

Sub acute appendicitis-1

Chronic appendicitis-9

Others-nil

Normal -3

The age wise distribution of the above is as depicted:

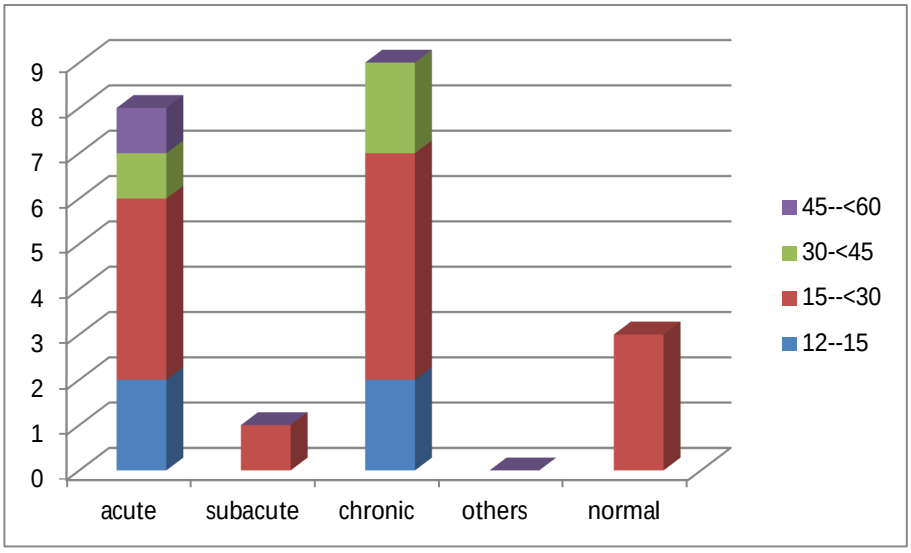


Fig.6

Female patients

Acute appenditis-3

Subacute appendicitis-6

Chronic appendicitis-12

Others-nil

Normal-3

The age wise distribution of the above is as follows:

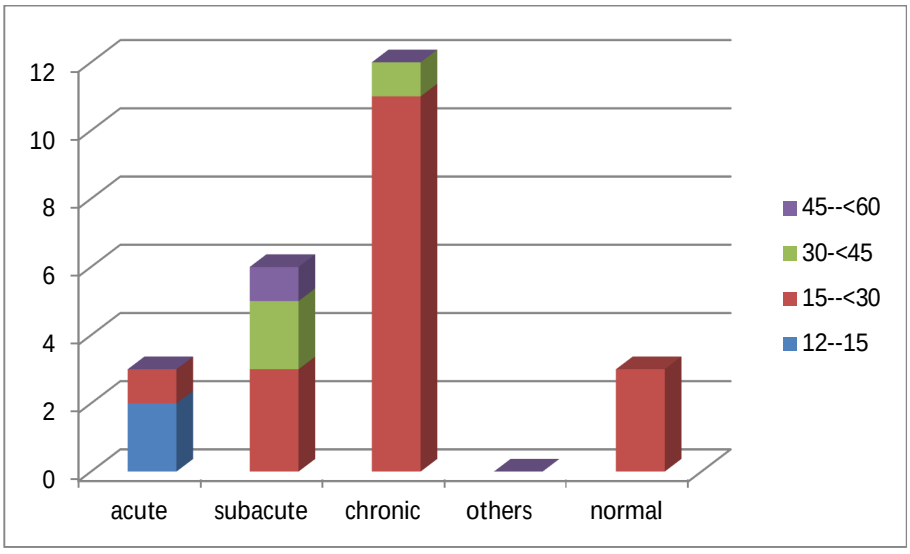


Fig.7

Histopathology Analysis

In both the groups of patients the following criteria were analysed:

- Serosal congestion.
- Luminal obstruction.
- Mucosal ulceration.
- Type of infiltrates.
- Eosinophilic infiltration in muscularis.
- Other associated pathologies.

Serosal Congestion

	Emergency	**delayed**	**Total**
present	**57**	**31**	**88**
absent	**16**	**14**	**30**

Table.2

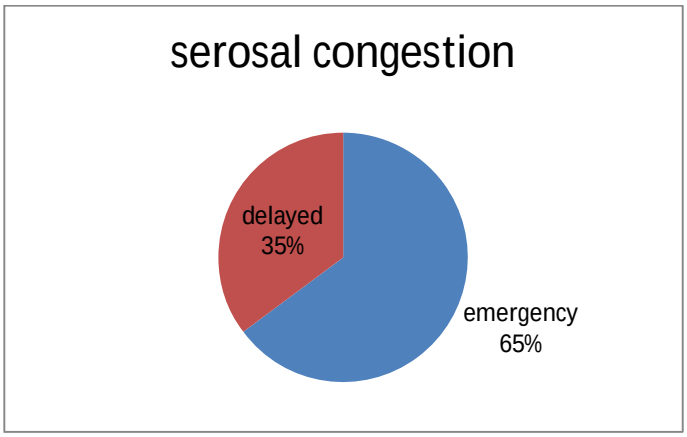


Fig.8

Luminal obstruction

Luminal obstruction was noted both in the emergency and delayed appendicectomy group.

	Emergency	Delayed	Total
present	39	27	66
absent	34	18	52
	73	45	118

Table.3

Luminal Obstruction is represented as below:

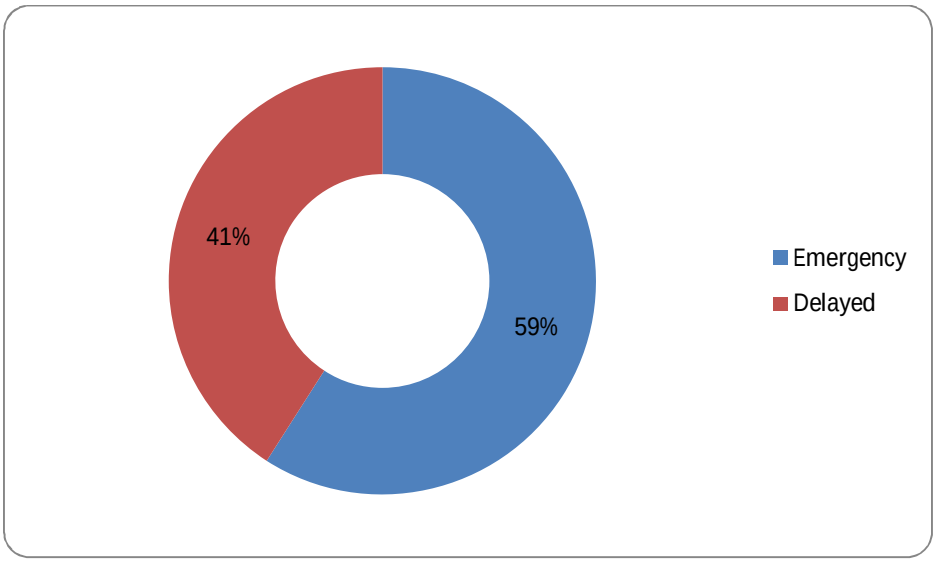


Fig.9

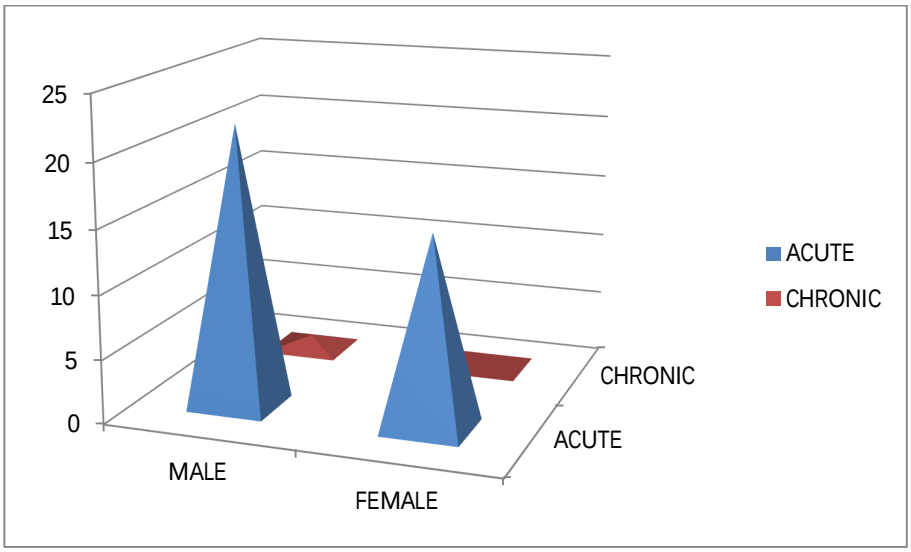
Mucosal inflammation

The following chart depicts the mucosal inflammation pattern in Emergency appendicectomy group of patients:

	MALE	FEMALE	TOTAL
ACUTE	22	15	37
CHRONIC	1	0	1

Table.4

Mucosal inflammation



Types of mucosal infiltrate:

Type of mucosal/submucosal infiltrates:	
A) neutrophils-	49
B) Lymphocytes-	33
C)neutrophil and lymphocytes-	18
D)neutrophil and eosinophil-	8
E)normal pattern-	10

Table.5

TYPES OF MUCOSAL/SUBMUCOSAL INFILTRATES

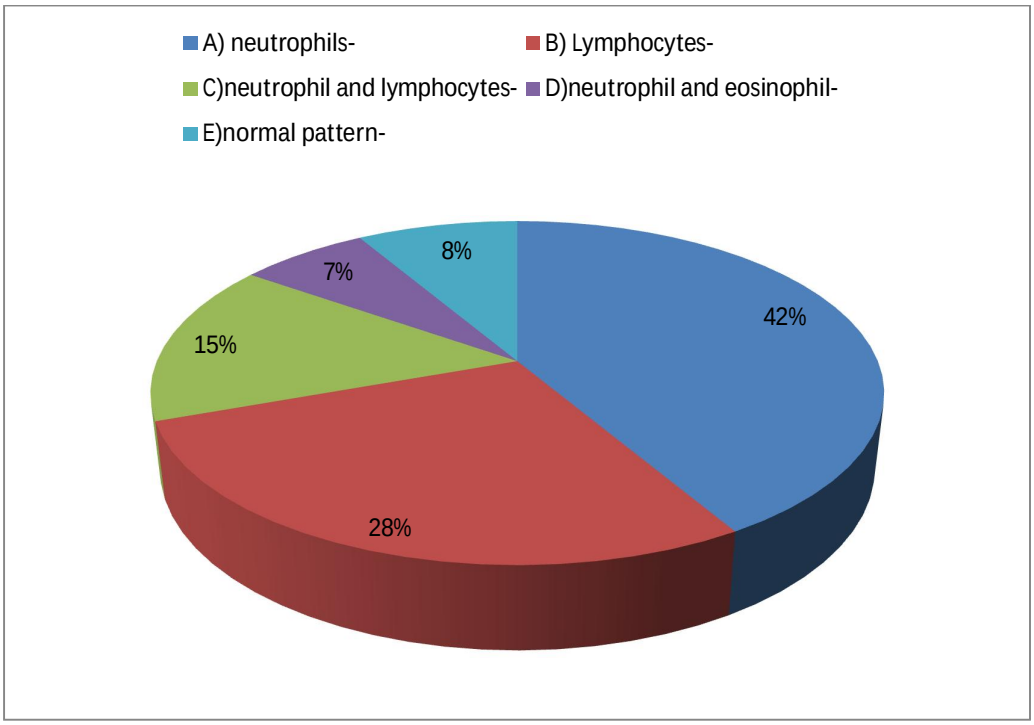


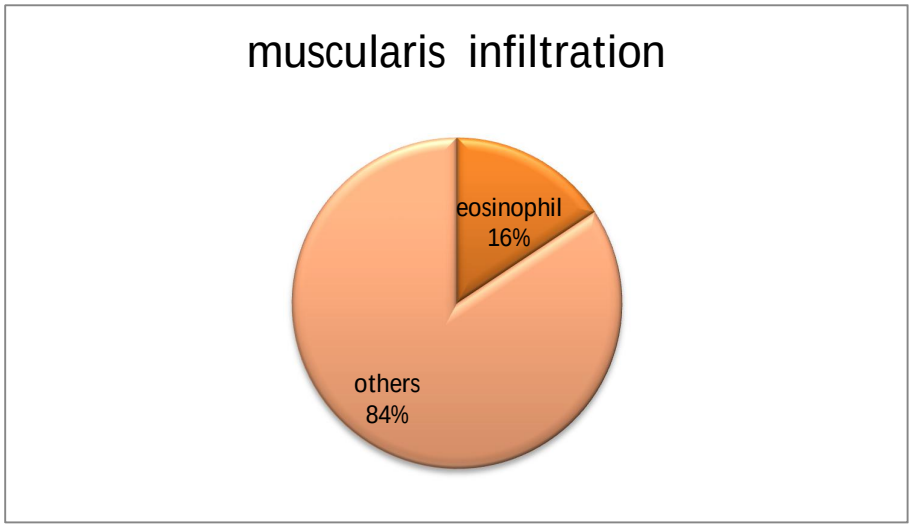
Fig.10

EOSINOPHILIC INFILTRATION IN MUSCULARIS:

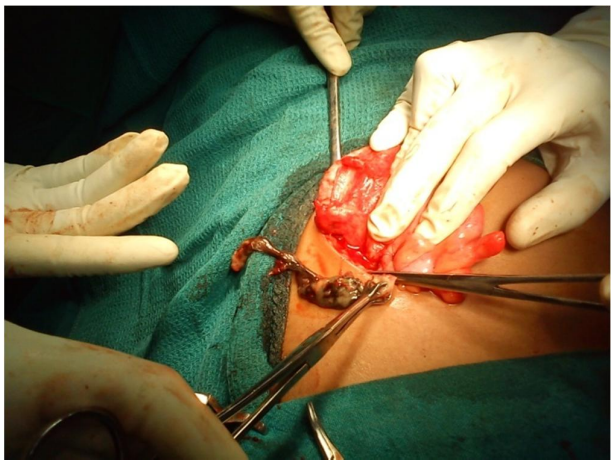
Eosinophilic Infiltration of the muscularis along with the neutrophils was found in a group of patients with acute appendicitis. The results are as below:

Total no of patients diagnosed with acute appendicitis : 51

Patients with eosinophilic infiltration along with neutrophils :8



A patient with Gangrenous Appendicitis



During our study we came across one patient each with Meckel's diverticulitis and Oxyuriasis vermicularis.

Two patients presented with appendicular perforation with histopathology showing tip perforation.

One patient presented with ileocaecal intussusception which was reduced and appendicectomy done.

We did not get any reports of carcinoids, benign tumors of the appendix, endometriosis, Crohn's disease or tuberculous lesions in our study.

DISCUSSION

Our Study included patients with appendicitis of age group of 12 to 59 years.

The mean age of incidence was 24 years. This correlates with other studies which quote an age range of 15-24 to have the highest incidence.

The male: female sex distribution in our study was 1:1, in contrast to the .other studies showing a ratio of 3:2

A diagnosis of acute appendicitis was given in 51of the 118 patients studied, of whom 40 had undergone emergency appendectomy and 11 had a delayed appendectomy.

In the emergency group 57.5% were males and 42.5% were females.

In the delayed group 72.5% were males and 27.5% were females. Alvarado scoring has a sensitivity of 87.5% and our study patients had an average score of 7.

The negative appendicectomy rate in our study was 8.4% ,more in female patients and was common in the age group of 15-<30 years.

This increased pattern in females suggests the role of diagnostic laparoscopy and watchful observation in female patients .It also suggest the possibilities of other diagnoses in them.

The importance of routine histopathological analysis of the appendix retrieved during surgery has been stressed by many authors in the context of analysing the type of lesion, its correlation with clinical features and for the diagnosis of any other lesions in the appendix. This is followed in our setup.

- Serosal congestion was earlier considered as early form of appendicitis.
- Presently it is regarded as periappendicitis and presence of it in the absence of mucosal/submucosal inflammation is interpreted as significant.
- It indicates other causes of peritonitis like pelvic inflammatory disease, perforation of bowel etc., which might need further management. In our study too we observed similar pattern in a patient with Meckel's diverticulitis.

Serosal congestion was present in 65% of emergency appendicectomy and 35% of delayed appendicectomy patients in our study.

The presence of such high rate of serosal congestion in the latter group suggests that the inflammation has not resolved and the intervention by surgery was appropriate.

Lymphoid follicles are regarded the most common agent to cause appendiceal luminal obstruction which foreruns most of the acute appendicitis. This occurs due to bacterial and viral invasion of the submucosal lymphoid follicles resulting in their hypertrophy.

Fecoliths are considered the next common etiological agent.

In contrast to this in our study fecolith was the commonest agent causing luminal obstruction.

In studies done to follow the resolution of appendicitis after nonsurgical treatment, using ultrasonogram ,the response was delayed as sonographically documented ,when there is an appendiculolith.

Since our group of patients are presenting commonly with fecolith the chance of resolution of the condition can be delayed if managed conservatively.

Mucosal Inflammation

According to Howie, the histological features of mucosal inflammatory changes include

1. Presence of neutrophils in the lumen of the appendix.

2. Focus of ulceration of the mucosa with neutrophilic invasion of the adjacent stroma

3. Lack of involvement of deeper layers.

This was mentioned by other authors as ‘endoappendicitis’, ‘acute focal appendicitis’ and ‘limited acute appendicitis’.

The mucosal inflammation is related to the severity of the symptomatology as denoted by elevated Alvarado scores in our study.

This also correlates with the study of Piper et al.

Mucosal inflammation was found mostly in emergency appendicectomy group relating it to the severity of the clinical scoring and hence our intervention.

A lower incidence of mucosal inflammation in the delayed appendicectomy group can be explained that it has resolved partly with

the conservative management and also that the severity scoring had a positive relation with the same.

- Eosinophilic infiltration of the muscularis apart from its presence in mucosal and submucosal layers has been discussed as Eosinophil Edema reaction by Aravindan et al and has been oserved in this study too.The condition is described as another etiological event in onset of appendicitis and attributed to allergy. However its correlation to parasitic infestation remains unclear.

LIMITATIONS OF THE STUDY

- Being an observational study, patients could not be ascertained to particular study group and there is a possibility of observer's bias.
- The duration of observation in the delayed appendicectomy group is not fixed.
- The reporting variation among different pathologist has not been addressed and single reporting had to be taken as final.

CONCLUSION

The study states that histopathological analysis in appendicectomy is absolutely necessary in guiding further management. However the role of conservative management remains selective in our group of patients and majority benefit from surgical intervention.

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Comparison of histopathology in emergency appendicectomy and delayed appendicectomy specimens

Investigator: Dr.Jessima Subahani.K., PGY2 – MS (Gen Surg)

Guide: **Prof. Dr. C.Balamurugan,** Chief, Unit S7.

Informed Consent

Name: Age/ Sex: IP:

I herewith declare that I have been explained in a language fully understood by me regarding the purpose of this study, methodology, proposed intervention, plausible side effects, if any and sequelae.

I have been given an opportunity to discuss my doubts and I have received the appropriate explanation.

I understand that my participation in this study is completely voluntary and that I am free to withdraw from this study at anytime without any prior notice &/ or without having my medical or legal rights affected.

I permit the author and the research team full access to all my records at any point, even if I have withdrawn from the study. However my identity will not be revealed to any third party or publication.

I herewith permit the author and the research team to use the results and conclusions arising from this study for any academic purpose, including but not limited to dissertation/ thesis or publication or presentation in any level.

Therefore, in my full conscience, I give consent to be included in the study and to undergo any investigation or any intervention therein.

Investigator's Sign Patient's sign

(Dr. Jessima Subahani.K) Date:

Comparison of histopathology in emergency appendicectomy and delayed appendicectomy specimens

Investigator: Dr.Jessima Subahani.K PGY2 – MS (Gen Surg)
Guide: Prof. Dr.C.Balamurugan

Patient Information Module

You are being invited to be a subject in this study.

Before you participate in this study, I am giving you the following details about this trial, which includes the aims, methodology, intervention, possible side effects, if any and outcomes:

All patients diagnosed with acute appendicitis based on clinical scoring system and ultrasonogram will be included in this study. A detailed clinical history will be taken following a standardized proforma. A detailed clinical examination will be made and relevant investigations, basic and special investigations including ultrasound will be done. After complete evaluation, patients will be posted for surgery either by open method or laparoscopy .During surgery a complete assessment of the macroscopic and cut section appearance of the appendix is noted down. Appendix specimen sent is for pathology and pathological changes noted down.

The results arising from this study will be analyzed and used for academic purposes. You will be given clear instructions at every step and you are free to ask/ clarify any doubts. Your identity will remain confidential. You are free to withdraw from this trial at any point of time, without any prior notice &/ or without any medical or legal implications.

I request you to volunteer for this study.

Thanking You,

Investigator's Sign Patient's Sign

(Dr.Jessima Subahani.K) (Name:)

PROFORMA

Comparison of Histopathology in Emergency appendicectomy and Delayed appendicectomy specimens

Investigator: **Dr.Jessima Subahani.K.,** PGY2 – MS (Gen Surg)

Guide: **Prof. Dr.C.Balamurugan.**

Name: Age/ Sex: I.P. No.:
Address: Contact no:

D.O.A: D.O.S: D.O.D:
History and Physical:

Investigations:

HEMAT					
HB					
PCV					
RBC					
TC					
DC					
PLT					
ESR					
RBS FBS PPBS					
B.UREA					
S.CREAT					
S.Na+					
S.K+					
S.Cl-			BL.GROUP		
S.HCO3-					

ALVARADO SCORE	
USG	
PATIENT INTERVAL	
HOSPITAL INTERVAL	
PER OP FINDINGS A)MACROSCOPIC B)CUTSECTION	
HISTOPATHOLOGICAL EXAMINATION REPORT	

S.NO.	NAME	AGE	SEX	IP NO	HPE NO	ALVARADO SCORE	EMERG/DELAYED	SEROSAL CONGESTION	LUM.OBST
1	MALATHY	17	FEMALE	3920	517/12	6	E	NO	NO
2	PRIYA	12	FEMALE	4144	524/12	7	E	NO	YES
3	POOVARASAN	14	MALE	3950	532/12	7	E	YES	YES
4	SURESH	15	MALE	3954	533/12	6	D	YES	YES
5	DHIVYA	16	FEMALE	4913	623/12	6	D	NO	YES
6	VISALI	17	FEMALE	5815	736/12	6	E	NO	NO
7	JOTHILAKSHMI	17	FEMALE	5864	737/12	7	E	NO	NO
8	MONISHA	17	FEMALE	6669	865/12	8	E	YES	YES
9	JEYANTHI	16	FEMALE	6708	866/12	8	E	YES	YES
10	MADHIVANAN	17	MALE	6628	869/12	6	E	YES	NO
11	MALLIGA	50	FEMALE	5919	933/12	6	D	YES	YES
12	GAYATHRI	15	FEMALE	7628	990/12	6	E	YES	NO
13	SYNAS BEGAM	18	FEMALE	7580	989/12	6	E	YES	NO
14	THIYAGARAJAN	23	MALE	7571	988/12	9	E	YES	YES
15	DEVAKI	58	FEMALE	7638	991/12	7	E	YES	NO
16	LAVANYA	20	FEMALE	7666	994/12	6	D	YES	NO
17	KARTHIK	27	MALE	8642	1105/12	6	E	YES	NO
18	SASIKALA	30	FEMALE	8667	1108/12	8	E	YES	YES
19	SARAVANAN	23	MALE	9545	1224/12	6	D	NO	NO
20	SHANTHI	32	FEMALE	9380	1227/12	7	D	YES	YES
21	DAWLATH	28	FEMALE	9554	1232/12	6	E	NO	YES
22	KUTTIAMMAL	32	FEMALE	10512	1351/12	8	E	NO	NO
23	DEVI	29	FEMALE	10673	1355/12	7	E	YES	NO
24	BABITHA	21	FEMALE	10742	1376/12	7	E	YES	YES
25	DEVA	31	MALE	10686	1379/12	9	E	YES	YES
26	BAKTHAVATCHALAM	46	MALE	10809	1381/12	9	E	YES	YES
27	NAPOLEAN	37	MALE	9498	1386/12	7	D	TES	YES
28	NISHA	18	FEMALE	9607	1228/12	6	D	YES	YES
29	PRABAKARAN	34	MALE	10901	1402/12	8	E	NO	YES
30	KARTHIKA	27	FEMALE	10918	1403/12	6	E	YES	YES
31	DEEPA	26	FEMALE	10969	1406/12	6	D	NO	YES

32	KUMAR	18	MALE	11075	1388/12	9	E	YES	NO
33	MURALI	32	MALE	11053	1420/12	7	E	YES	YES
34	RAMYA	14	FEMALE	11177	1440/12	7	E	YES	NO
35	GOMATHI	17	FEMALE	11374	1474/12	6	D	NO	NO
36	SADAM	22	MALE	11541	1506/12	8	E	NO	YES
37	BANUPRIYA	21	FEMALE	11528	1508/12	9	E	YES	NO
38	GUNASEKARAN	28	MALE	11542	1509/12	7	D	NO	NO
39	RAZIA BEGUM	22	FEMALE	11984	1515/12	6	D	NO	NO
40	DAMODARAN	39	MALE	15733	1519/12	8	E	YES	YES
41	GEETHA	21	FEMALE	15613	1520/12	7	E	YES	YES
42	PITCHAIAMMAL	42	FEMALE	15839	1541/12	7	E	YES	NO
43	RISWAN	17	MALE	15854	1542/12	6	D	YES	NO
44	THAMEEM ANSARI	22	MALE	15923	1543/12	6	D	YES	NO
45	KARTHIK	22	MALE	16120	1588/12	7	E	NO	NO
46	ROSE	35	FEMALE	16309	1601/12	6	E	YES	NO
47	KARTHICK	18	MALE	16492	1658/12	7	E	YES	YES
48	YOGESH	17	MALE	16319	1664/12	6	D	YES	YES
49	CHITRA	27	FEMALE	16618	1665/12	7	D	YES	YES
50	SARAVANAN	17	MALE	16491	1668/12	6	D	NO	YES
51	GUNASEKAR	15	MALE	16293	1669/12	6	D	YES	YES
52	YOGESH	32	MALE	17210	1717/12	6	E	NO	YES
53	MANIVEL	25	MALE	17109	1718/12	7	E	NO	NO
54	PRABAKARAN	17	MALE	18193	1802/12	8	E	YES	YES
55	SARAVANAN	17	MALE	18139	1803/12	6	E	NO	NO
56	VADESWARI	17	FEMALE	18220	1821/12	8	E	YES	NO
57	REEGAN	23	MALE	18381	1832/12	6	D	NO	NO
58	SARASWATHI	24	FEMALE	18625	1857/12	7	D	YES	YES
59	JAYA	38	FEMALE	18371	1866/12	7	E	YES	YES
60	KAVITHA	26	FEMALE	18961	1887/12	6	D	YES	NO
61	SAVITHRI	28	FEMALE	19034	1908/12	8	E	NO	NO
62	THABOORA	17	FEMALE	19961	2007/12	7	E	YES	YES
63	NAGARAJ	18	MALE	19904	2008/12	9	E	YES	NO
64	JOGRA BEE	48	FEMALE	19952	2010/12	7	E	YES	YES

65	MURUGAN	40	MALE	19987	2011/12	8	E	YES	NO
66	KALAISELVI	17	FEMALE	20564	2135/12	6	D	YES	YES
67	GANGADHARAN	35	MALE	20925	2162/12	6	D	YES	YES
68	HUSSAIN	14	MALE	21873	2275/12	7	D	NO	YES
69	SUNDAR	58	MALE	22946	2431/12	6	D	NO	NO
70	MADHAVAN	18	MALE	24027	2466/12	9	E	YES	YES
71	KARTHIK	20	MALE	24013	2467/12	9	E	YES	YES
72	JULIE	32	FEMALE	24022	2468/12	8	E	YES	YES
73	KAVITHA	27	FEMALE	23896	2469/12	8	E	YES	YES
74	JAFIRULLA	13	MALE	24663	2551/12	7	E	NO	NO
75	JAYAKUMAR	20	MALE	24637	2552/12	7	E	YES	NO
76	REKHA	20	FEMALE	24623	2553/12	7	E	YES	NO
77	SARALA	38	FEMALE	25075	2596/12	6	D	NO	YES
78	RAJESWARI	50	FEMALE	26400	2701/12	7	E	YES	YES
79	DEVI	32	FEMALE	27456	2827/12	8	E	YES	NO
80	ANBUKARASI	42	FEMALE	27408	2828/12/	7	E	YES	YES
81	MASUDHA FATHIMA	14	FEMALE	27428	2896/12	6	D	YES	YES
82	MOHAN	24	MALE	27399	2897/12	6	D	YES	YES
83	JEEVARANI	21	FEMALE	28449	2949/12	7	E	YES	YES
84	SATHISH	25	MALE	28517	2950/12	6	D	YES	YES
85	SYED ALI FATHIMA	27	FEMALE	28974	3016/12	6	D	YES	YES
86	SARANYA	25	FEMALE	28949	3017/12	6	D	YES	YES
87	ANITHA	21	FEMALE	29678	3071/12	6	D	YES	YES
88	ROHIT	17	MALE	29621	3084/12	9	E	YES	YES
89	KAMATCHI	15	FEMALE	28982	3116/12	8	E	YES	NO
90	MURUGAN	33	MALE	28423	3125/12	7	D	YES	NO
91	SUMATHY	26	FEMALE	30250	3233/12	8	E	NO	YES
92	NAKMA	14	FEMALE	30586	3243/12	7	D	NO	YES
93	ROBERT	15	MALE	30587	3302/12	7	E	YES	YES
94	MUNUSAMY	14	MALE	31503	3361/12	7	E	YES	YES
95	UMESH KUMAR	15	MALE	31559	3363/12	6	E	YES	NO
96	MANSUR	13	MALE	31480	3364/12	7	D	YES	YES
97	BALAJI	24	MALE	32496	3489/12	8	E	YES	YES

98	MURUGAN	15	MALE	32536	3490/12	7	E	YES	NO
99	DAVID	21	MALE	32384	3559/12	7	E	YES	YES
100	KUMARESAN	20	MALE	33522	3621/12	6	D	YES	NO
101	PADMA	35	FEMALE	33302	3623/12	6	D	YES	NO
102	RENUKA	16	FEMALE	33409	3686/12	6	D	NO	NO
103	SIVARAJ	38	MALE	34216	3727/12	7	E	YES	NO
104	AMMU	18	FEMALE	34219	3728/12	8	E	YES	NO
105	JUSTIN	14	MALE	34215	3729/13	7	E	YES	NO
106	VAISHNAVI	18	FEMALE	34268	3752/12	6	D	YES	NO
107	GNANAMMAL	24	FEMALE	35048	3844/12	8	E	YES	YES
108	ANAND	21	MALE	35136	3843/12	7	E	YES	YES
109	POOVARASAN	15	MALE	36035	3941/12	7	E	YES	NO
110	MAHESWARAN	34	MALE	36492	4001/12	9	E	YES	YES
111	DEEPA	25	FEMALE	36063	4025/12	6	D	YES	NO
112	LALITHA	27	FEMALE	36088	4027/12	7	E	YES	NO
113	ASHWINI	19	FEMALE	36697	4067/12	6	D	NO	YES
114	SYED MANSOOR	20	MALE	37051	4136/12	6	D	NO	NO
115	MAYURI	29	FEMALE	37028	4137/12	7	D	YES	YES
116	RAVI	15	MALE	42507	4841/12	6	D	YES	YES
117	MANOHAR	20	MALE	42572	4839/12	6	D	YES	YES
118	RAJASEKAR	24	MALE	41852	4722/12	8	E	YES	YES

MUCOSAL ULCERATION	INFLM.REACTION	HPE	REMARKS
NO	LYMPHOYTES	CHRONIC APPENDICITIS	_
YES	NEUTROPHILS	ACUTE APPENDICITIS	_
NO	LYMPHOCYTES	CHRONIC APPENDICITIS	_
YES	NEUTRO/LYMPHO	SUB ACUTE APPENDICITIS	_
NO	LYMPHOCYTES	CHRONIC APPENDICITIS	_
NO	FEW NEUTROPH.	NORMAL STUDY	_
NO	FEW NEUTROPH.	NORMAL STUDY	_
NO	LYMPHOCYTES	CHRONIC APPENDICITIS	_
NO	LYMPHOCYTES	CHRONIC APPENDICITIS	_
NO	LYMPHOCYTES	CHRONIC APPENDICITIS	_
NO	NEUTRO/LYMPHO	SUB ACUTE APPENDICITIS	_
NO	LYMPHOCYTES	CHRONIC APPENDICITIS	_
NO	LYMPHOCYTES	CHRONIC APPENDICITIS	_
YES	NEUTROPHILS	APPENDICULAR PERF.	TIP-SEROSAL EXUDATE
NO	LYMPHOCYTES	CHRONIC APPENDICITIS	_
NO	LYMPHOCYTES	CHRONIC APPENDICITIS	_
NO	LYMPHOCYTES	CHRONIC APPENDICITIS	_
YES	NEUTRO/LYMPHO	SUB ACUTE APPENDICITIS	_
NO	FEW NEUTROPH.	NORMAL STUDY	_
YES	NEUTRO/LYMPHO	SUB ACUTE APPENDICITIS	_
NO	LYMPHOCYTES	CHRONIC APPENDICITIS	_
NO	NEUTRO/LYMPHO	SUB ACUTE APPENDICITIS	FIBROTIC
NO	NEUTRO/LYMPHO	SUB ACUTE APPENDICITIS	_
NO	NEUTRO/LYMPHO	SUB ACUTE APPENDICITIS	_
YES	NEUTROPHILS	ACUTE APPENDICITIS	_
YES	NEUTORPHILS	APPENDICULAR PERF.	_
NO	LYMPHOCYTES	CHRONIC APPENDICITIS	_
NO	LYMPHOCYTES	CHRONIC APPENDICITIS	_
YES	NEUTROPHILS	ACUTE APPENDICITIS	_
NO	LYMPHOCYTES	CHRONIC APPENDICITIS	_
NO	LYMPHOCYTES	CHRONIC APPENDICITIS	_

YES	NEUTROPHILS	ACUTE APPENDICITIS	_
YES	NEUTRO/LYMPHO	SUB ACUTE APPENDICITIS	_
NO	NEUTRO/LYMPHO	SUB ACUTE APPENDICITIS	_
NO	FEW NEUTROPH.	NORMAL STUDY	_
YES	NEUTRO/LYMPHO	SUB ACUTE APPENDICITIS	FIBROTIC
YES	NEUTROPHILS	ACUTE APPENDICITIS	_
YES	NEUTROPHILS	ACUTE APPENDICITIS	FIBROTIC
YES	NEUTRO/LYMPHO	SUB ACUTE APPENDICITIS	_
YES	NEUTROPHILS	ACUTE APPENDICITIS	_
YES	NEUTRO/LYMPHO	SUB ACUTE APPENDICITIS	_
YES	NEUTRO/LYMPHO	SUB ACUTE APPENDICITIS	_
NO	LYMPHOCYTES	CHRONIC APPENDICITIS	_
NO	LYMPHOCYTES	CHRONIC APPENDICITIS	_
YES	NEUTRO/LYMPHO	SUB ACUTE APPENDICITIS	_
NO	LYMPHOCYTES	CHRONIC APPENDICITIS	_
YES	NEUTROPHILS	ACUTE APPENDICITIS	EXUBERANT GRANULATION TISSUE
YES	NEUTROPHILS	ACUTE APPENDICITIS	_
YES	NEUTRO/LYMPHO	SUB ACUTE APPENDICITIS	_
NO	LYMPHOCYTES	CHRONIC APPENDICITIS	_
NO	LYMPHOCYTES	CHRONIC APPENDICITIS	_
NO	NEUTRO/LYMPHO	SUB ACUTE APPENDICITIS	_
YES	NEUTROPHILS	ACUTE APPENDICITIS	REDUCED INTUSSUSCEPTION
NO	NEUTRO/LYMPHO	SUB ACUTE APPENDICITIS	_
YES	NEUTROPHILS	ACUTE APPENDICITIS	_
NO	NEUTRO/LYMPHO	SUB ACUTE APPENDICITIS	WITH MECKELS DIVERTICULITIS
NO	FEW NEUTROPH.	NORMAL STUDY	_
NO	LYMPHOCYTES	CHRONIC APPENDICITIS	_
YES	NEUTROPHILS	ACUTE APPENDICITIS	_
YES	NEUTROPHILS	ACUTE APPENDICITIS	_
YES	NEUTROPHILS	ACUTE APPENDICITIS	_
YES	NEUTROPHILS	ACUTE APPENDICITIS	_
YES	NEUTROPHILS	ACUTE APPENDICITIS	EOSINOPHIL IN MUCOSA
YES	NEUTROPHILS	ACUTE APPENDICITIS	_

YES	NEUTRO/EOSINO	ACUTE APPENDICITIS	EOSINOPHIL IN MUCOSA
NO	LYMPHOCYTES	CHRONIC APPENDICITIS	_
NO	LYMPHOCYTES	CHRONIC APPENDICITIS	_
NO	NEUTROPHILS	ACUTE APPENDICITIS	_
YES	NEUTROPHILS	ACUTE APPENDICITIS	_
YES	NEUTROPHILS	ACUTE APPENDICITIS	_
YES	NEUTROPHILS	ACUTE APPENDICITIS	_
YES	NEUTROPHILS	ACUTE APPENDICITIS	_
YES	NEUTROPHILS	ACUTE APPENDICITIS	_
NO	FEW NEUTROPH.	NORMAL STUDY	_
NO	NEUTROPHILS	ACUTE APPENDICITIS	FIBROTIC/COVERED WITH EXUDATE
NO	NEUTROPHILS	ACUTE APPENDICITIS	_
NO	NEUTRO/LYMPHO	SUB ACUTE APPENDICITIS	_
NO	NEUTROPHILS	ACUTE APPENDICITIS	_
NO	NEUTRO/EOSINO	ACUTE APPENDICITIS	_
NO	NEUTRO/PL.CELL	ACUTE APPENDICITIS	_
NO	NEUTRO/EOSINO	ACUTE APPENDICITIS	_
NO	NEUTRO/EOSINO	ACUTE APPENDICITIS	_
YES	NEUTROPHILS	ACUTE APPENDICITIS	_
NO	NEUTROPHILS	ACUTE APPENDICITIS	_
NO	LYMPHOCYTES	CHRONIC APPENDICITIS	_
NO	LYMPHOCYTES	CHRONIC APPENDICITIS	_
NO	LYMPHOCYTES	CHRONIC APPENDICITIS	_
YES	NEUTROPHILS	ACUTE APPENDICITIS	_
YES	LYMPHOCYTES	CHRONIC APPENDICITIS	SECTION OF WORM
NO	NEUTROPHILS	ACUTE APPENDICITIS	_
NO	NEUTROPHILS	ACUTE APPENDICITIS	_
NO	NEUTROPHILS	ACUTE APPENDICITIS	_
YES	NEUTROPHILS	ACUTE APPENDICITIS	_
NO	NEUTRO/EOSINO	ACUTE APPENDICITIS	_
NO	NEUTRO/EOSINO	ACUTE APPENDICITIS	_
NO	NEUTRO/EOSINO	ACUTE APPENDICITIS	_
YES	NEUTROPHILS	ACUTE APPENDICITIS	_

NO	NEUTROPHILS	ACUTE APPENDICITIS	_
NO	NEUTROPHILS	ACUTE APPENDICITIS	_
NO	LYMPHOCYTES	CHRONIC APPENDICITIS	_
NO	LYMPHOCYTES	CHRONIC APPENDICITIS	_
NO	FEW NEUTROPH.	NORMAL STUDY	_
NO	NEUTROPHILS	ACUTE APPENDICITIS	FOCAL AREAS OF NECROSIS
NO	NEUTROPHILS	ACUTE APPENDICITIS	_
NO	NEUTROPHILS	ACUTE APPENDICITIS	_
YES	LYMPHOCYTES	CHRONIC APPENDICITIS	_
YES	NEUTROPHILS	APPENDICULAR PERF.	TIP-PERFORATED
NO	NEUTROPHILS	ACUTE APPENDICITIS	_
YES	NEUTRO/LYMPHO	SUB ACUTE APPENDICITIS	_
YES	NEUTROPHILS	ACUTE SUPPURATIVE APPENDICITIS	
NO	LYMPHOCYTES	CHRONIC APPENDICITIS	_
YES	NEUTROPHILS	ACUTE APPENDICITIS	_
NO	LYMPHOCYTES	CHRONIC APPENDICITIS	FIBROTIC
NO	FEW NEUTROPH.	NORMAL STUDY	_
NO	NEUTRO/LYMPHO	SUB ACUTE APPENDICITIS	_
NO	LYMPHOCYTES	CHRONIC APPENDICITIS	GANGRENOUS
NO	LYMPHOCYTES	CHRONIC APPENDICITIS	_
NO	NEUTROPHILS	ACUTE APPENDICITIS	_